

(12) UK Patent Application (19) GB (11) 2 280 322 (13) A

(43) Date of A Publication 25.01.1995

(21) Application No 9414559.6

(22) Date of Filing 19.07.1994

(30) Priority Data

(31) 05183099

(32) 23.07.1993

(33) JP

05243679

03.09.1993

(71) Applicant(s)

NEC Corporation

(Incorporated in Japan)

7-1, Shiba 5-Chome, Minato-Ku, Tokyo 108-01, Japan

(72) Inventor(s)

Shigeo Yoshihara

Michio Nagai

Masaki Ichihara

(74) Agent and/or Address for Service

Mathys & Squire

10 Fleet Street, London, EC4Y 1AY, United Kingdom

(51) INT CL⁶

H04B 1/38, H01Q 1/24

(52) UK CL (Edition N)

H3Q QACA Q1G Q1K

H4L LECX L30

U1S S2215

(56) Documents Cited

EP 0603012 A1

EP 0508299 A1

(58) Field of Search

UK CL (Edition M) H3Q QAA QACA QAK, H4L LECX

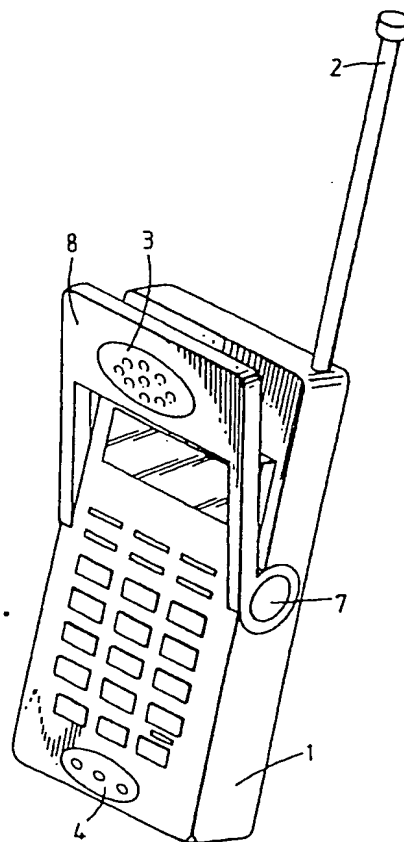
INT CL⁵ H01Q 1/24 1/52, H04B 1/38

Online databases:WPI

(54) Reducing interaction between the aerial of a portable radio telephone and usershead'

(57) A portable radio apparatus includes an antenna, a transceiver body having a speaker on an upper portion thereof and a microphone on a lower portion thereof, and a mechanism for drawing out the speaker from the body to a side close to an ear of an operator. Also, in a portable radio apparatus including a transceiver body, a speaker provided in the body and an antenna provided on the body, the transceiver body is divided into a first unit including a speaker and a second unit coupled with the first unit, and the antenna is projected from the second unit (see eg. fig. 7). Various other embodiments, including the use of bent aeriels, are disclosed.

Fig.1B.



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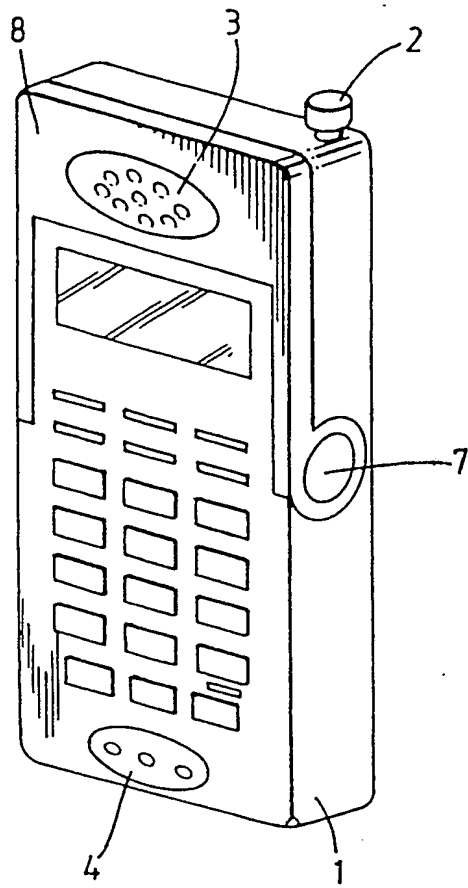


Fig. 1A.

Fig. 1B.

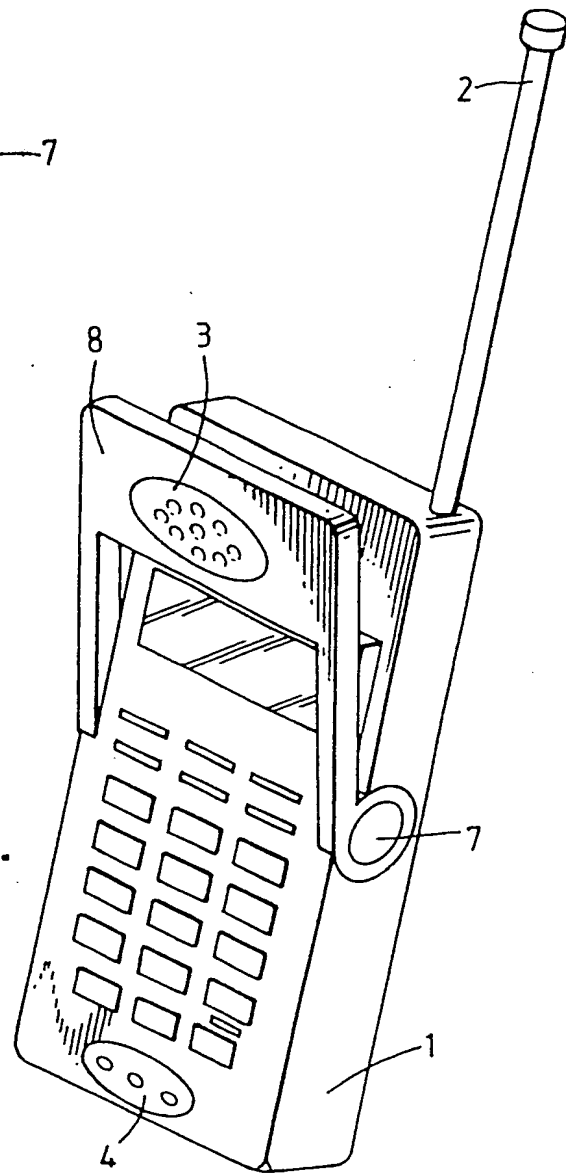


Fig.2.

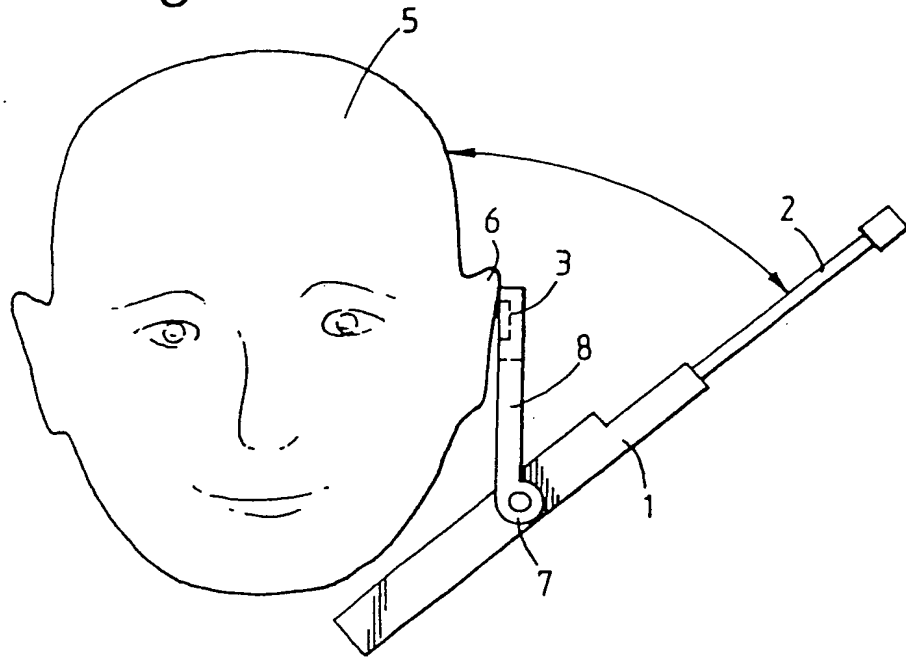


Fig.3.

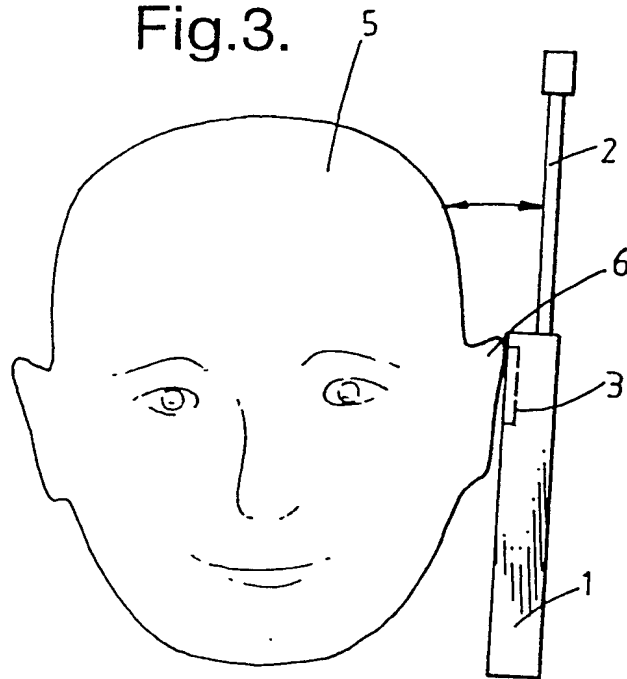


Fig.4A.

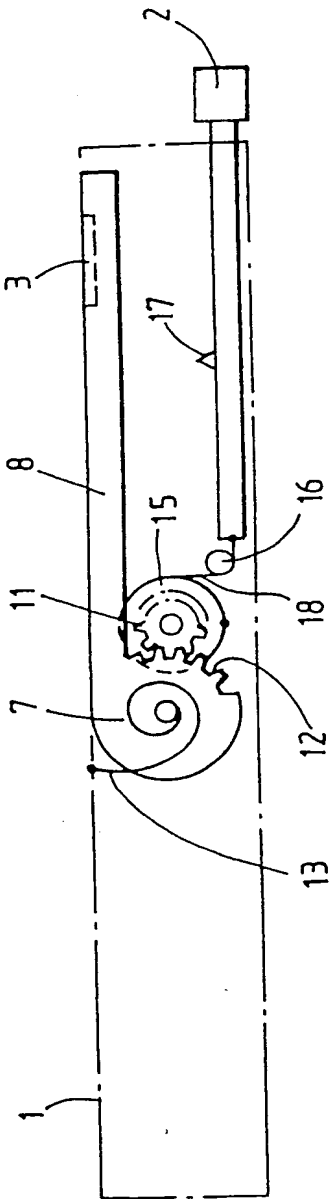
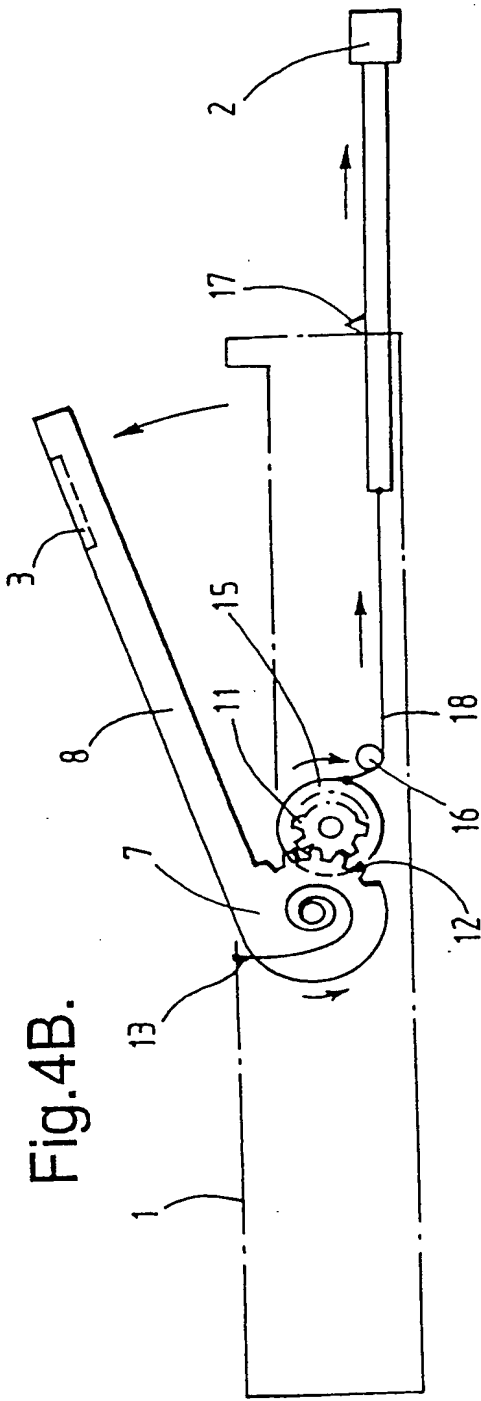


Fig.4B.



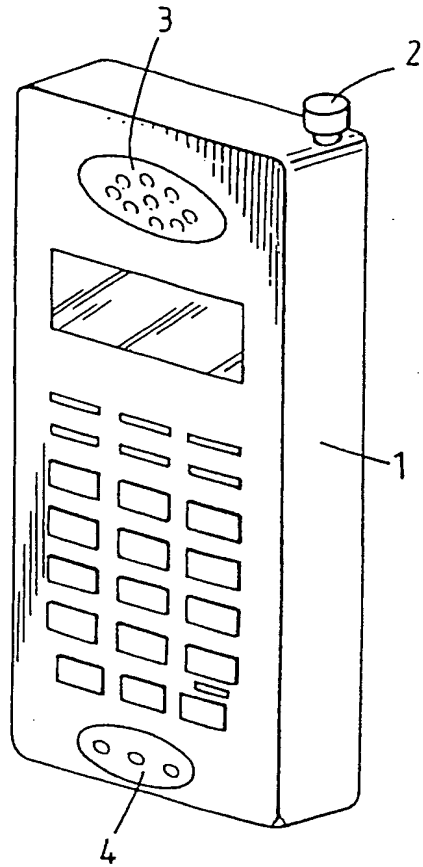


Fig. 5A.

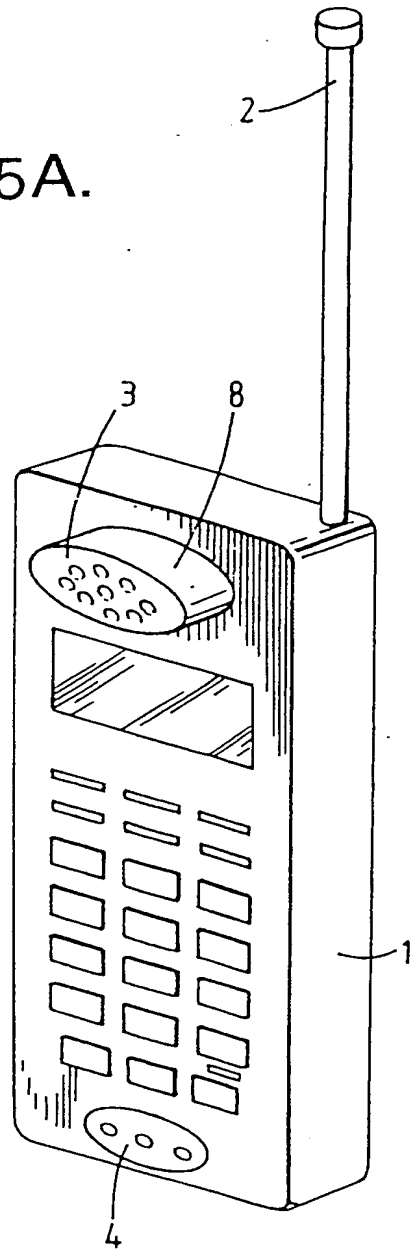
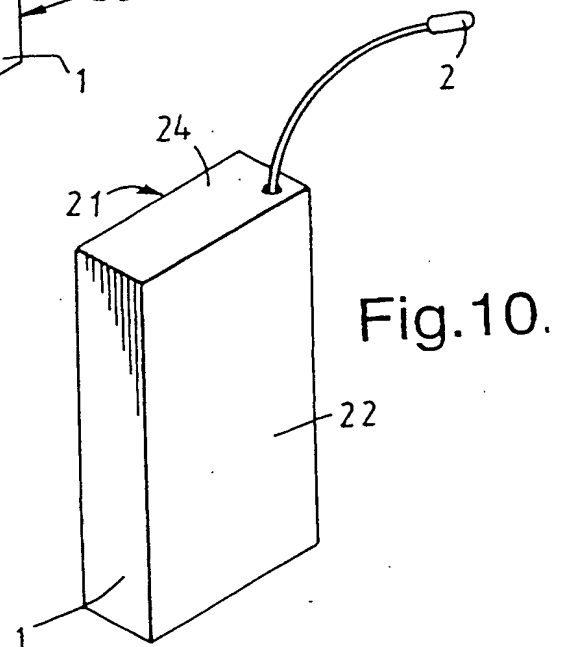
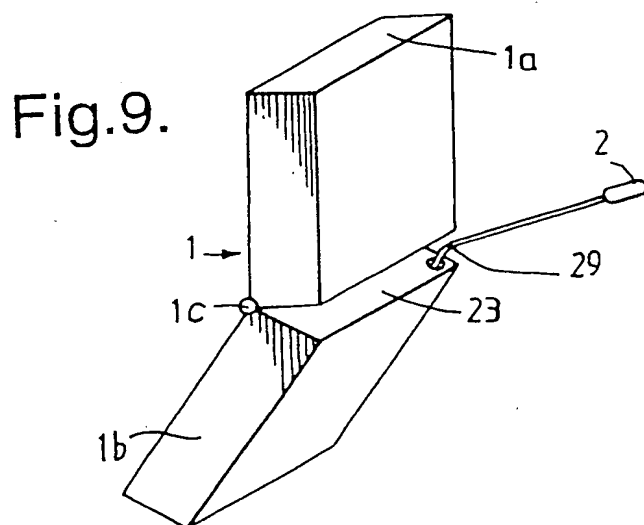
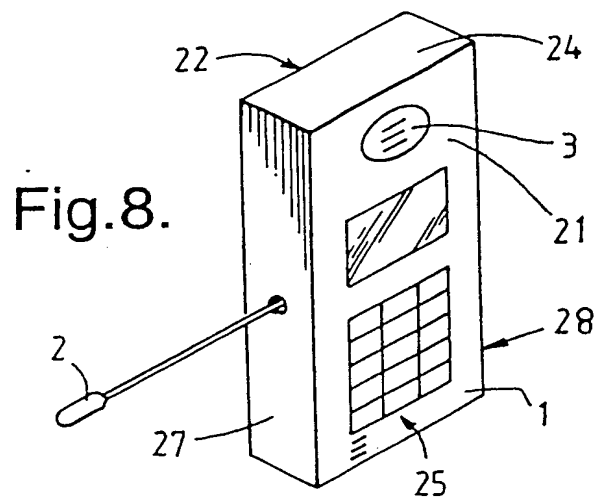
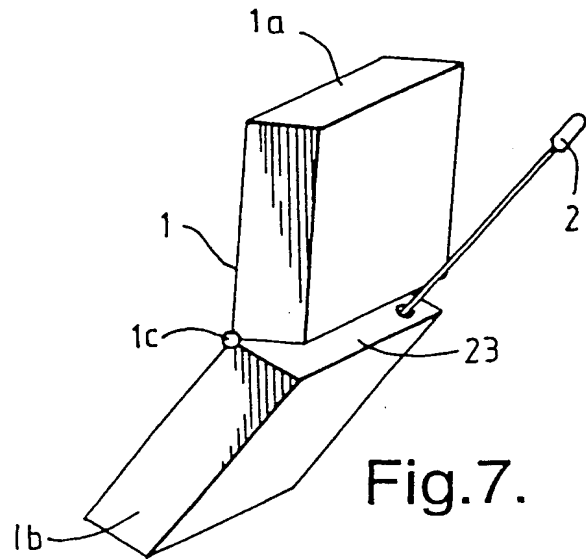
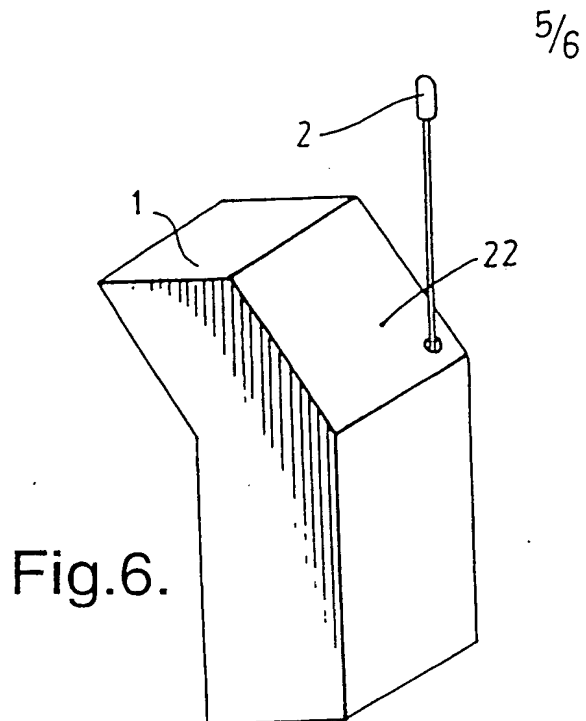
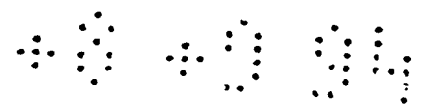


Fig. 5B.





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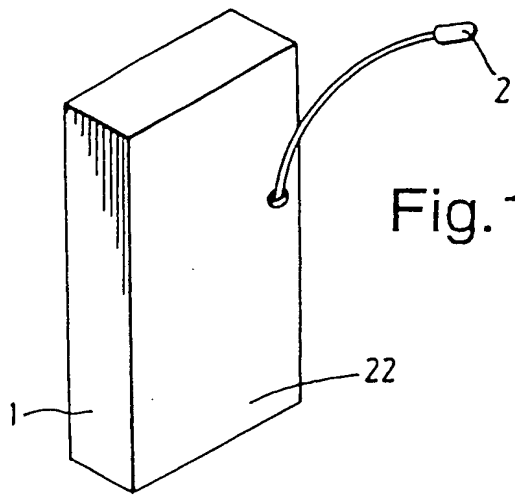


Fig. 11.

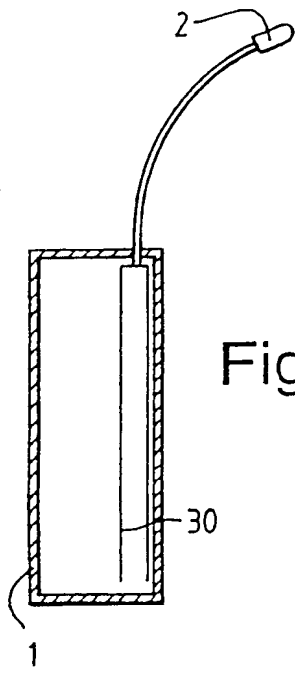


Fig. 12A.

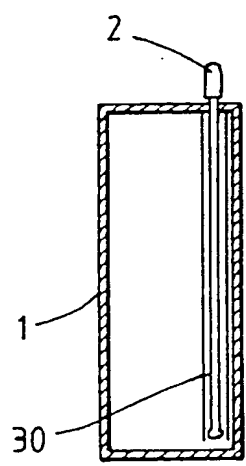


Fig. 12B.

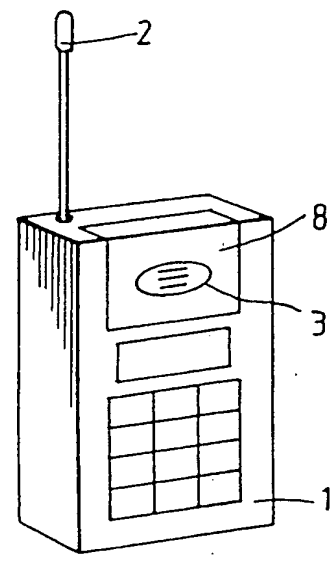


Fig. 13A.

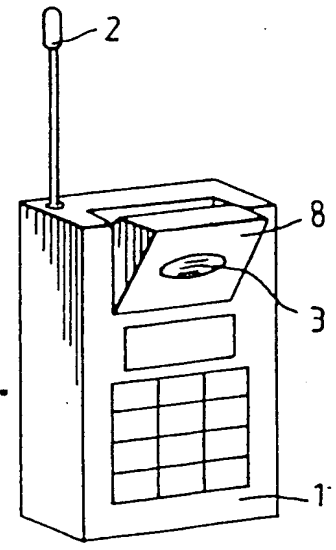


Fig. 13B.

PORTABLE RADIO APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a portable radio communication apparatus, and more particularly to an antenna arrangement for a portable radio communication
5 apparatus.

In a conventional typical portable radio apparatus, an antenna and a receiver are disposed on an upper portion of the portable radio apparatus body. In particular, the receiver is fixed to the portable radio apparatus body,
10 and a transmitter is provided in a lower portion of the body. In such a conventional portable radio apparatus, since the receiver is brought in close contact with the ear when calling, the antenna inevitably approaches the human head.

15 Thus, during calls made with the antenna close to the human head, the radio waves transmitted from or received by the antenna are adversely affected by the head, as a result of which there arise such problems that the radiation pattern of the transmitted radio waves gets
20 warped, radio waves transmitted from certain directions are difficult to receive, and the reception sensitivity is liable to deteriorate.

Conventionally, as a portable radio apparatus in which such problems are solved, there has been known a structure in which an antenna is disposed on a side portion or on a lower portion of the apparatus body, as shown in Japanese
5 Laid Open Patent Application Nos. Sho 63-67032 and Hei 4-127723. Further, as a different type, there has been proposed a portable radio apparatus having a structure in which radio waves are not radiated in the vicinity of the head, as disclosed in Japanese Laid Open Patent Application
10 No. Sho 59-92629.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a novel portable radio apparatus which is capable of reducing the influence of the human head on radio waves transmitted
15 from or received by an antenna as much as possible when calling.

The portable radio apparatus of the present invention has a mechanism for drawing a receiver away from a portable radio apparatus body to the human ear in order to keep the
20 antenna away from the human head when calling. With such a structure, at the time of calling, when the receiver is drawn out from the portable radio apparatus body to the human ear side so as to be brought into contact with the ear, since the antenna is away from the head to a certain
25 degree, the influence of the head on the radio waves

transmitted from or received by the antenna is reduced.

Further, in the portable radio apparatus of the present invention, the antenna is capable of being drawn out from the back or the side of the body in order to keep the antenna away from the human head.

In most embodiments, the antenna projects out of a plane substantially parallel to the side of the operator's head.

As used herein the terms "receiver" and "transmitter" may include the complete receiver or transmitter, or just the transducer portion thereof (loudspeaker or microphone) or any intermediate combination of the transducer and part or all of its associated electronic circuitry, the remainder of the circuitry for example being housed in the body portion of the apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention, and together with the description, serve to explain the objects, advantages and principles of the invention. In the drawings,

Figs. 1A and 1B are perspective views showing a non-calling state and a calling state of a portable telephone in accordance with a first embodiment of the present invention, respectively;

Fig. 2 is a diagram for explaining an operating state of the portable telephone in accordance with the first embodiment of the present invention;

Fig. 3 is a diagram for explaining an operating state of a conventional portable telephone;

Figs. 4A and 4B are diagrams showing a state where an antenna is accommodated in a portable telephone body and a state where the antenna is drawn out from the portable telephone body in the first embodiment of the present invention, respectively;

Figs. 5A and 5B are diagrams showing a non-call state and a call state of a portable telephone in accordance with a second embodiment of the present invention, respectively;

5 Figs. 6 to 11 are perspective views showing a portable telephone in accordance with a third to an eighth embodiment of the invention, respectively;

Figs. 12A and 12B are diagrams showing a call state and a non-call state of a portable telephone in accordance with a ninth embodiment of the present invention,
10 respectively; and

Figs. 13A and 13B are diagrams showing a modification of the embodiment of Figs. 5A and 5B.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 1A and 1B show, as an example of a portable
15 radio apparatus, a portable telephone in accordance with a first embodiment of the invention in which an antenna 2 is withdrawably accommodated in a portable radio apparatus body 1. A receiving portion 8 on which a receiver 3 is mounted is fitted by means of a hinge portion 7 to an
20 upper portion of the body 1, and a transmitter 4 is provided on a lower portion of the body 1. In a non-call state, the antenna 2 is accommodated in the portable telephone body 1, and also the receiver 8 is in close contact with the portable telephone body 1 so that the
25 portable transceiver is compact. In a call state, as

shown in Fig. 1B, the antenna 2 is drawn out from the portable telephone body 1, and the receiving portion 8 can be raised up from the portable telephone body 1 to the ear of the user by rotation of the hinge 7.

5 Fig. 2 is a diagram showing an operating condition of the portable telephone in accordance with the embodiment. As shown in the figure, when the receiver 3 of the body 1 is brought into close contact with the ear, the antenna 2 can be kept far apart from the head 5 of the user in
10 comparison with a conventional operating condition shown in Fig. 3.

 Figs. 4A and 4B show an example of a mechanism in which, when the antenna 2 is drawn out from the portable telephone body 1 in a call state, the receiving portion 8
15 can be automatically moved away from the portable telephone body 1.

 Fig. 4A shows a state in which the antenna 2 is accommodated in the portable telephone body 1, whereas Fig. 4B shows a state in which the antenna 2 is drawn out
20 from the body 1. A cord 18 is attached to the end of the antenna 2 and wound on the periphery of a pulley 15 via a roller 16. A gear 11 is fixed to the pulley 15 which rotates with the gear 11, whereas a gear 12 which interlocks the gear 11 is fixed to the receiving portion 8.
25 A hinge 7 is provided on the receiving portion 8 in such a manner that the receiving portion 8 is rotated by

rotation of the gear 12. A spiral spring 13 is fitted to the hinge 7 in such a manner that a clockwise rotational force is always exerted on the receiving portion 8 by the elastic force of the spiral spring 13 so that force is applied to the receiving portion 8 in the direction in which the receiving portion 8 is accommodated in the portable telephone body 1. A spring-like claw 17 for stopping the antenna 2 is disposed on the antenna 2 so that the antenna 2 is not retracted again when it is drawn out from the body 1.

In the portable telephone thus constituted, when the antenna 2 is drawn out, the cord 18 is drawn in the direction indicated by an arrow (see Fig. 4B), to thereby make the pulley 15 rotate in the direction indicated by an arrow. As a result, the gear 12 as well as the gear 11 rotates so that the hinge 7 which supports the receiving portion 8 is rotated against the clockwise rotational force applied by the spiral spring 13, whereby the receiving portion 8 is rotated so as to be move away from the body 1 and be raised up as shown in the Fig. 4B. When the antenna 2 has been drawn out, force is exerted on the antenna 2 in a direction in which the antenna 1 is drawn in. However, since the antenna 2 is stopped by the claw 17, the receiving portion 8 is also kept apart from the body 1.

Figs. 5A and 5B show a portable telephone in accordance

with a second embodiment of the invention. In the figures, a portable telephone body 1 includes an antenna 2, a receiver 3 on an upper portion thereof, and a transmitter 4 on a lower portion thereof. In a non-call state, the antenna 2 is accommodated in the portable telephone body 1, and the receiver 3 is also accommodated in the portable telephone body 1 so that the portable telephone is made compact. On the other hand, in a call state, as shown in Fig. 5B, the antenna 2 is drawn out and a receiving portion 8 per se containing the receiver 3 therein projects from the portable telephone body 1, as shown in Fig. 5B. Therefore, when the receiver 3 is brought into close contact with an ear of an operator, since the upper portion of the portable telephone body 1 is moved away from the ear, the antenna 2 is also inevitably moved away from the head of the operator.

The receiving portion 8 may be modified as shown in Figs. 13A and 13B. The receiving portion 8 shown in Figs. 13A and 13B is fitted by means of a hinge to the body 1 so that it freely projects from the body 1.

In the second embodiment, the antenna 2 and receiver 3 may be drawn out by hand, and fixed with respect to the portable telephone body 1 by a spring-like claw. Alternatively, as in the mechanism of the first embodiment shown in the Figs. 4A and 4B, there can be provided a mechanism in which the antenna 2 is

drawn out to automatically project the receiver 3 from the portable telephone body 1 to the human ear.

Other embodiments will be described in which an antenna is drawn out from the back, the side or the like
5 of a portable telephone body to remove the influence of the human head on the antenna.

Referring to Fig. 6, a portable telephone includes an antenna 2 which is constituted so as to project upward from a middle portion of a back surface 22 of a portable
10 telephone body 1.

Referring to Fig. 7, a portable telephone comprises a portable telephone body 1 which is divided into a first unit 1a having a receiver and a second unit 1b having no receiver. The second unit 1b is connected to a lower
15 portion of the first unit 1a through a folding portion 1c so as to be foldable. An antenna 2 is constituted so as to project from an upper surface 23 of the second unit 1b upward in a direction extending toward the first unit 1a.

Referring to Fig. 8, a portable telephone is provided
20 with a portable telephone body 1 which includes a front surface 21 having a receiver 3, a back surface 22 opposed to the front surface 21. The body 1 also includes an upper surface 24 which is nearest the receiver 3 among surfaces adjacent to the front surface 21 and the back
25 surface 22, a bottom surface 25 opposed to the upper surface 24, one side surface 27 adjacent to the front

surface 21, the back surface 22, the upper surface 24
and the bottom surface 25, and another side surface 28
opposite the side surface 27. An antenna 2 is constituted
so as to project from the side surface 27 in a direction
5 in which the antenna 2 moves away from the body 1.

Referring to Fig. 9, as shown in Fig. 7, a portable
telephone body 1 is divided into an upper unit 1a having
a receiver and a lower unit 1b having no receiver. The
lower unit 1b is foldably connected to a lower portion
10 of the upper unit 1a through a folding portion 1c. An
antenna 2 is constituted so as to project from the upper
end surface 23 of the lower unit 1b. The antenna 2 has
a folding point 29 in the vicinity of the lower unit 1b,
at which the direction of projection of the antenna 2 is
15 capable of being changed.

In the above-mentioned embodiments shown in Figs.
6 to 9, the antenna 2 can be accommodated in the interior
of the body 1.

Referring to Fig. 10, a portable telephone body 1
20 includes a front surface 21 with a receiver, a back
surface 22 opposed to the front surface 21, and an upper
surface 24 which is nearest the receiver among surfaces
adjacent to the front surface 21 and the back surface 22.
An antenna 2 is previously formed in a curved shape so as
25 to be bent in a direction in which the antenna 2 moves
away from the receiver (front surface 21) when it is drawn,

and projects from the upper surface 24 of the body 1.

Further, as shown in Fig. 11, an antenna 2 may be projected from a middle portion of the back surface 22 of the portable telephone body 1.

5 Further, as shown in Fig. 12A, in the case of the portable telephone shown in Fig. 10, the antenna 2 is in its pre-formed curved shape when the antenna 2 projects from the portable telephone body 1. On the other hand, when the antenna 2 is accommodated in the portable telephone
10 body 1, as shown in Fig. 12B, the antenna 2 is inserted into a straight tube 30 disposed in interior of the body 1, thus being accommodated in the body 1. Also, the antenna 2 of the portable telephone shown in Fig. 11 is accommodated in the body 1 in the same manner.

15 The foregoing description of preferred embodiments of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and modifications and variations are possible
20 in light of the above teachings or may be acquired from practice of the invention. The embodiments were chosen and described in order to explain the principles of the invention and its practical application to enable one skilled in the art to utilize the invention in various
25 embodiments and with various modifications as are suited to the particular use contemplated. It is intended that

the scope of the invention be defined by the claims appended hereto, and their equivalence.

Each feature disclosed in this specification (which term includes the claims) and/or shown in the drawings may be incorporated in the invention independently of other disclosed and/or illustrated features.

The appended abstract as filed herewith is included in the specification by reference.

CLAIMS:

1. A portable radio apparatus, comprising:
 - a body;
 - an antenna provided on an upper portion of said body;
 - a receiver provided on the upper portion of said body; and
 - drawing-out means for drawing out said receiver from said body to a side close to an ear of an operator, whereby in use, the antenna projects away from the side of the operator's head.
2. A portable radio apparatus as claimed in Claim 1, wherein said drawing-out means comprises a receiving portion on which said receiver is mounted, said receiving portion being hinge-coupled with said body.
3. A portable radio apparatus as claimed in Claim 1, wherein said drawing-out means comprises a receiving portion on which said receiver is mounted, said receiving portion being capable of protruding from said body.
4. A portable radio apparatus as claimed in Claim 1, wherein said antenna of an accommodated-type antenna which is accommodated in said body in a non-call state and drawn out from said body in a call state, and said drawing-out means cooperates with operation of drawing out said antenna from said body.
5. A portable radio apparatus, comprising:
 - a body having a front surface and a back surface opposed to said front surface;
 - a receiver provided in said front surface; and
 - an antenna provided on said body, said antenna being projected from said back surface of said body, whereby in use the antenna projects away from the operator's head.

6. A portable radio apparatus, comprising:
 - a body having a first unit and a second unit coupled with said first unit;
 - a receiver provided in said first unit of said body; and
 - an antenna provided on said body, said antenna being projected from said second unit, whereby in use the antenna projects away from the operator's head.

7. A portable radio apparatus, comprising:
 - a body having a front surface, a back surface opposed to said front surface, an upper surface adjacent to said front and back surfaces, a bottom surface opposed to said upper surface, and side surfaces adjacent to said front surface, said back surface, said upper surface and said bottom surface;
 - a receiver provided in said front surface of said body; and
 - an antenna provided on said body, said antenna being projected from one of said side surfaces of said body in a direction in which said antenna is spaced apart from said body whereby in use the antenna projects away from the operator's head.

8. A portable radio apparatus, comprising:
 - a body;
 - a receiver provided in said body; and
 - an antenna projected from said body, said antenna having means for changing a projected direction of said antenna in the vicinity of said body so that in use the antenna may be directed away from the operator's head.

9. A portable radio apparatus, comprising:
 - a body;
 - a receiver provided in said body; and
 - an antenna capable of being freely accommodated in and drawn out from said body, said antenna being previously formed in a curved shape and bent in a direction in which said antenna is spaced apart from said receiver

when said antenna is drawn out from said body and in use is directed away from the operator's head.

10. A portable radio apparatus as claimed in Claim 5, wherein said body is divided into an upper unit and a lower unit, and said receiver is provided on said upper unit.

11. A portable radio apparatus as claimed in Claim 6, wherein said first unit is freely expanded or contracted with respect to said second unit, and said antenna cooperates with said first unit in such a manner that said antenna is expanded when said first unit is expanded, and said antenna is contracted when said first unit is contracted.

12. A portable radio apparatus as claimed in Claim 11, wherein said first unit is rotatable with respect to said second unit.

13. A portable radio apparatus as claimed in Claim 11, wherein said first unit is slidable with respect to said second unit.

14. A portable radio apparatus substantially as herein described with reference to Figures 1A, 1B, 2, 4A and 4B, or Figures 5A and 5B, or any of Figures 6 to 11, or Figures 12 and 12, or Figures 13A and 13B of the accompanying drawings.

-15-

Relevant Technical Fields

- (i) UK Cl (Ed.M) H3Q (QACA, QAA, QAK) H4L (LECX)
(ii) Int Cl (Ed.5) H01Q 1/24, 1/52 H04B 1/38

Databases (see below)

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- (ii) ONLINE DATABASES : WPI

Search Examiner
D Midgley

Date of completion of Search
30 August 1994

Documents considered relevant
following a search in respect of
Claims :-
1-14

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- A: Document indicating technological background and/or state of the art. &: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
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X	EP 0508299 A1 (SIEMENS) whole document	1,5-9 at least

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